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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/821,415

03/28/2001

Yehiel Gotkis

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01/11/2005

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EXAMINER

VU, HUNG K

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/821,415

Applicant(s)

GOTKIS ET AL.

Examiner

Hung Vu

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6,8 and 26-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6,8,26 and 27 is/are allowed.
- 6) ☒ Claim(s) 28,31,32 and 34 is/are rejected.
- 7) ☐ Claim(s) 29,30,33 and 35 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 28, 31, 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyagi et al. (PN 6,573,170) in view of Ahn et al. (PN 6,277,728, of record).

Aoyagi et al. discloses, as shown in Figures 17-19, a semiconductor device comprising,

a substrate (1) having transistor devices;

an intermetal dielectric layer (ILD) (61) including conductive contacts defining a first interconnect level of a plurality of interconnect levels of the semiconductor device;

a passivation layer (62) defined over the ILD layer;

a plurality of copper interconnect metallization lines and conductive vias (53,54,31,34) defined in each remaining interconnect levels of the plurality of interconnect levels of the semiconductor device defined over the passivation layer,, the plurality of copper interconnect metallization lines and conductive vias being isolated from each other by only a dielectric material (63,29);

Aoyagi et al. does not disclose the dielectric material is a porous dielectric material. However, Ahn et al. discloses the plurality of copper interconnect metallization lines and conductive vias (48,54,70) isolated from each other by dielectric material (56) including a porous dielectric

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material. Note Figures 1-12 and Table of Ahn et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric material of Aoyagi et al. by a porous dielectric material, such as taught by Ahn et al. because a porous dielectric material is commonly used as the interlayer dielectric material and it helps to reduce the coupling capacitance between the interconnects.

Regarding claim 31, Aoyagi et al. and Ahn et al. disclose the device further comprising a passivation-capping layer (36) defined over a topmost layer of the copper interconnect metallization lines and conductive vias.

Regarding claim 32, Aoyagi et al. and Ahn et al. disclose the plurality of copper interconnect metallization lines and conductive vias define dual damascene structures.

2. Claims 28, 31, 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mochizuki et al. (PN 6,815,330) in view of Ahn et al. (PN 6,277,728, of record).

Mochizuki et al. discloses, as shown in Figures 19-23, a semiconductor device comprising,

- a substrate (1) having transistor devices;

- an intermetal dielectric layer (ILD) (10) including conductive contacts defining a first interconnect level of a plurality of interconnect levels of the semiconductor device;

- a passivation layer (51) defined over the ILD layer;

- a plurality of copper interconnect metallization lines and conductive vias (37,38,133-135) defined in each remaining interconnect levels of the plurality of interconnect levels of the

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semiconductor device defined over the passivation layer,, the plurality of copper interconnect metallization lines and conductive vias being isolated from each other by only a dielectric material (13,30);

Mochizuki et al. does not disclose the dielectric material is a porous dielectric material.

However, Ahn et al. discloses the plurality of copper interconnect metallization lines and conductive vias (48,54,70) isolated from each other by dielectric material (56) including a porous dielectric material. Note Figures 1-12 and Table of Ahn et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric material of Mochizuki et al. by a porous dielectric material, such as taught by Ahn et al. because a porous dielectric material is commonly used as the interlayer dielectric material and it helps to reduce the coupling capacitance between the interconnects.

Regarding claim 31, Mochizuki et al. and Ahn et al. disclose the device further comprising a passivation-capping layer (39) defined over a topmost layer of the copper interconnect metallization lines and conductive vias.

Regarding claim 32, Mochizuki et al. and Ahn et al. disclose the plurality of copper interconnect metallization lines and conductive vias define dual damascene structures.

Allowable Subject Matter

3. Claims 6, 8, 26 and 27 allowed.

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4. Claims 29, 30, 33 and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. The following is an examiner's statement of reasons for allowance:

Applicant's claims 29, 30, 33 and 35 are allowable over the references of record because none of these references disclose or can be combined to yield the claimed semiconductor device further comprising a plurality of supporting stubs, each of the plurality of supporting stubs configured to form a supporting column that extends through each remaining interconnect level of the plurality of interconnect levels, as recited in claims 29 and 35.

Response to Arguments

6. Applicant's arguments with respect to claims 28 and 34 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

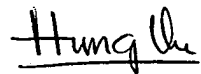
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (571) 272-1666. The examiner can normally be reached on Mon-Thurs 6:00-3:30, alternate Friday 7:00-3:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The Central Fax Number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

January 4, 2005

A handwritten signature in black ink, appearing to read "Hung Vu", written over a horizontal line.

Hung Vu

Primary Examiner